

## **Principles and Criteria for Integrative Studies Courses Biological and Physical Sciences**

Courses designed to fulfill the Integrative Studies requirement for Biological and Physical Sciences must meet the following criteria.

Science and the technologies developed from scientific research influences many aspects of life both for the individual and for society. In addition, science provides remarkable opportunities for the productive expression of personal curiosity and disciplined growth in the life of the mind. It is important that the educated individual have some understanding of the methods, results and limitations of scientific enquiry. Within this context, each course will consider the following.

1. The way in which science investigates and draws conclusions.
2. The results of this mode of enquiry, using selected examples from the discipline on which the course is based.
3. The social impact of science in its historical context.

The courses will be thematic in nature and demonstrate the integrative nature of scientific investigations. It is recognized that one cannot cover the whole of science or even the whole of one discipline within the limitations imposed by the Integrative Studies Program. The courses are not intended to be survey courses or an introduction to the major. It is important that introductory material necessary to enable understanding of the main theme of the courses be presented at the beginning.

The three foci referred to above can be illustrated by the content from any field of science. Given the variety of faculty and student interests, there will be a variety of courses open to the student. In the interest of remaining as close as possible to a common core the number of courses will be limited.

Each course will be a three credit course and have the option of a one credit lab/practical experience (see below).

### **BIOLOGICAL SCIENCES**

The biological sciences (including system biology, cell biology, molecular biology and environmental/population biology) influence our daily lives in a variety of ways that can be integrated into three broad areas: (1) the nature and history of life, (2) the environment, and (3) medicine. These courses will develop an understanding of biological science together with its social and historical impacts.

More specifically, these courses will introduce the student to basic biological principles, observations, and concepts and will acquaint them with a knowledge of the methods used by selected scientists. Sections of these courses will be taught by faculty from different departments, and the emphasis will vary accordingly. This flexibility will enable instructors to incorporate into the course some of their own experience as scientists and to present an in depth perspective of how selected biological case histories have influenced society in the past, are used in the present, and may be used for future predictions. It is the responsibility of the Center for Integrative Studies in General Science to promote adherence to these principles.

### **PHYSICAL SCIENCES**

The study of the physical universe can be approached from complementary perspectives. Astronomy and Geology study the large scale aspects of the origin and history of the universe, placing the earth and its resources in this context. Physics and chemistry investigate the nature of matter and forces at the fundamental level. These disciplines reach into adjacent fields to provide an integrated view of the physical universe. Courses in this group will focus on one of the areas and show how it involves the others.

### **CLOSING STATEMENT**

The social and historical aspects of science, as it relates to technology and resource exploitation will be integrated into each of these courses. A quantitative component will be included that requires that all students will have completed the University Mathematics requirement as a prerequisite.

### **LABORATORY/PRACTICAL REQUIREMENT**

A one credit lab/practical section must be taken concurrently with one of the courses. Sections with the lab/practical will be designated in the Schedule of Courses. The lab/practical experience must be designed to cover the following points.

1. Introduce students to some of the classical experiments/observations which led to major advances in understanding.
2. Enable students, through experiments, to learn first hand the limitations of measurements.
3. Involve the students in designing an experiment to test a particular hypothesis.

It is envisioned that each section with a lab/practical component will have a minimum of twelve exercises. Each exercise will be based on and coordinated with lecture material of the course with which it is associated and will be designed according to the above criteria. These exercises may include the conducting of experiments; hands-on interactive demonstrations; and simulated experimental design, data collection, and analysis. With computer simulations and model utilization, students will be guided in an evaluation of the impacts of various selected scientific developments of society.